**TECHNICAL REVIEW AND EVALUATION
OF APPLICATION FOR
AIR QUALITY PERMIT No. 89020**

I. INTRODUCTION

This Class II permit is for the construction and operation of Boral Materials LLC's (Boral) facility at the Kirkland Pozzolan Mine.

A. Company Information: Boral Materials LLC

Facility Name: Boral Kirkland Mine

Mailing Address: 10701 S River Front Pkwy, Suite 300

South Jordan, UT 84095

Facility Location: 7855 S Iron Springs Rd

Skull Valley, 86338

B. Attainment Classification

The Boral Kirkland Mine facility is located in Yavapai County, which is currently designated in attainment or unclassified for all National Ambient Air Quality Standards (NAAQS) for criteria pollutants.

II. PROCESS DESCRIPTION

A. Process Equipment

The Boral Kirkland Mine facility will extract and process natural pozzolan from the Kirkland Pozzolan Mine. Pozzolan is used as a fly ash replacement in concrete manufacturing.

The high-quality natural pozzolan will be excavated from the Kirkland Mine with conventional mining equipment and transported to a storage pile enclosed on 3 sides by haul trucks. Material from the storage pile will be fed by frontend loader into the feeder/breaker to reduce the initial size of the material prior to milling. The feeding process will take place within a 3-sided enclosure, and emission of particulate matter from the feeder/breaker will be controlled by the Mill Feed Breaker Discharge Baghouse.

The feeder then discharges the material onto a belt conveyer, which transfers the material to the grinding mill. The mill feed will be equipped with a filter at the transfer point to control emission of particulate matter. The material will be finely milled while simultaneously being dried due to the flow of gas from the Hot Gas Generator. Gas from the Hot Gas Generator enters the grinding mill, dries the material, and carries finely ground product into the Product Recovery Baghouse. The ground product will be captured by the Product Recovery Baghouse and discharged from the baghouse by an air slide, while the filtered gas exits the baghouse. Approximately 50% of the discharged gas will be recirculated to the Hot Gas Generator to control emission of nitrogen oxides (NO_X) while the remainder exits the main stack.

The processed material discharged from the Product Recovery Baghouse will be fed to storage silos equipped with bin vents by air slides and a bucket elevator, with emission of particulate matter being controlled by the Product Storage Baghouse. Material that does not meet product specifications during and after the milling process are classified and recirculated for further processing or storage in a rejects bin. The processed high-quality natural pozzolan will be stored in the silos and loaded into haul trucks and transported off-site. Particulate matter emissions from the loading operation will be controlled using cartridge filter modules installed at the loading station of the silos.

B. Control Devices

Boral Materials will utilize dust collectors (baghouses, bin vents, and filter modules) at the feeder input, mill transfer point, mill outlet, bucket elevator transfer points, storage bins and silos, and loading station to control emission of particulate matter. The Product Recovery Baghouse is considered inherent process equipment because the baghouse's primary purpose is to recover pozzolan product from the mill. A low-NO_X burner and flue gas recirculation system will be used to reduce emission of nitrogen oxides from the Hot Gas Generator.

III. LEARNING SITE EVALUATION

In accordance with ADEQ's Environmental Permits and Approvals near Learning Sites Policy, the Department is required to conduct an evaluation to determine if any nearby learning sites would be adversely impacted by the facility. Learning sites consist of all existing public schools, charter schools and private schools the K-12 level, and all planned sites for schools approved by the Arizona School Facilities Board. The learning sites policy was established to ensure that the protection of children at learning sites is considered before a permit approval is issued by ADEQ.

An analysis was conducted and it was found that Kirkland Elementary School is within 2.0 miles of the proposed facility. A modeling analysis for Hazardous Air Pollutants (HAPs) was conducted, and it was determined that the facility would not have an adverse impact on the learning site. A detailed discussion of the modeling analysis can be found in Section IX below.

IV. EMISSIONS

Boral Materials LLC's Kirkland Mine facility has the potential to emit (PTE) particulate matter nominally less than 10 microns (PM_{10}) and particulate matter nominally less than 2.5 microns ($PM_{2.5}$), nitrogen oxides (NO_X), carbon monoxide (CO), sulfur dioxide (SO_2), volatile organic compounds (VOCs), lead (Pb), and HAPs including arsenic, barium, and chromium. Emissions occur during excavation, loading, and transportation of the material; material processing; and material storage and truck loading. The facility's emissions were calculated using manufacturer's specifications and AP-42 emission factors.

The facility's controlled PTE is greater than the permitting exemption threshold for NO_X, PM_{10}, and $PM_{2.5}$. The facility's PTE is provided in Table 1 below:

Table 1: Controlled Potential to Emit

Pollutant	Controlled Emissions	Permitting Exemption Threshold	Minor NSR Triggered?	Fugitive Emissions[2]
NO_X	39.6	20	Yes	0
PM_{10}	7.87	7.5	Yes	11.45
$PM_{2.5}$	7.87	5	Yes	2.07
CO	9.8	50	No	0
SO_2	0.99	20	No	0
VOC	2.68	20	No	0
Pb	.008	0.3	No	.019
HAPs[1]	.013	N/A	No	.032

1 Emissions of Hazardous Air Pollutants in the form of arsenic, chromium, lead, and nickel were estimated as the percent of each HAP potentially present in the particulate matter emissions based on the highest value detected from laboratory analysis.

2 Fugitive emissions are not considered for source applicability determination in this case. However, fugitive emissions are accounted for in the modeling analysis used to determine compliance with the National Ambient Air Quality Standards (NAAQS).

V. MINOR NEW SOURCE REVIEW (NSR)

Minor new source review is required if the emissions of a new source have the potential to emit any regulated air pollutant at an amount greater than or equal to the permitting exemption threshold (PET) in Table 1 above. The facility's controlled emissions triggered minor NSR for PM_{10} and $PM_{2.5}$.

The facility has the option to either implement reasonably available control technology (RACT) or conduct screen modeling to satisfy the requirements of minor NSR. The facility elected to implement RACT to satisfy the requirements of minor NSR. RACT is required for each emission unit that has the potential to emit any regulated minor NSR pollutant in an amount equal to or greater than 20% of the permitting exemption threshold. To demonstrate compliance with RACT, the Permittee implemented dust collection systems (baghouses, bin vents, and filter modules) at each emission unit to control emission of particulate matter from the process. All dust collection systems installed at the facility meet the emission standards identified in New Source Performance Standard (NSPS) Subpart OOO for Standards of Performance for Non-Metallic Mineral Processing Plants, thus satisfying RACT in accordance with A.A.C. R18-2-334.D. Additionally, the hot gas generator is operated with a low NO_X burner and a flue gas recirculation system, thus satisfying RACT in accordance with A.A.C. R18-2-334.D.

VI. APPLICABLE REGULATIONS

Table 2 identifies applicable regulations and verification as to why that standard applies. The table also contains a discussion of any regulations the emission unit is exempt from.

Table 2: Applicable Regulations

Unit & year	Control Device	Rule	Discussion
Grinding Mill, Belt Conveyers, Bucket Elevators, Silos, and Storage Bins	Baghouses, bin vents, dust collectors, and filter modules	NSPS Subpart OOO NSPS Subpart UUU	The grinding mill, belt conveyers, and bucket elevators associated with the facility commenced construction after August 31, 1983 and are subject to NSPS Subpart OOO. The facility is not classified as one of 17 mineral processing plants listed in 40 CFR 60.731 due to the pozzolan material not meeting the ASTM standards for a lightweight aggregate and is not subject to NSPS Subpart UUU. Additionally, grinding equipment that also dries the process material at mineral processing plants are not subject to NSPS Subpart UUU.
Hot Gas Generator	Flue Gas Recirculation	A.A.C. R18-2-730 A.A.C. R18-2-724 NSPS Subpart Dc	Standards of Performance for Unclassified Sources. Standards of Performance for Fossil-fuel Fired Industrial and Commercial Equipment does not apply because the products of combustion come into contact with the process materials. The hot gas generator does not operate as a steam generating unit and is not subject to NSPS Subpart Dc.
Propane Pressure Vessels	N/A	NSPS Subpart Kb	The propane pressure vessels are designed to operate in excess of 204.9 kilopascals (kPa) and without emissions to the atmosphere and are not subject to NSPS Subpart Kb.
Fugitive dust sources	Water Trucks, Dust Suppressants	A.A.C. R18-2 Article 6 A.A.C. R18-2-702	These standards are applicable to all fugitive dust sources at the facility.
Abrasive Blasting	Wet blasting; Dust collecting equipment; Other approved methods	A.A.C. R-18-2-702 A.A.C. R-18-2-726	These standards are applicable to any abrasive blasting operation.

Unit & year	Control Device	Rule	Discussion
Spray Painting	Enclosures	A.A.C. R18-2-702 A.A.C. R-18-2-727	These standards are applicable to any spray painting operation.
Demolition/renovation Operations	N/A	A.A.C. R18-2-1101.A.8	This standard is applicable to any asbestos related demolition or renovation operations.

VII. MONITORING, RECORDKEEPING, AND REPORTING REQUIREMENTS

Table 3 contains an inclusive but not an exhaustive list of the monitoring, recordkeeping and reporting requirements prescribed by the air quality permit. The table below is intended to provide insight to the public for how the Permittee is required to demonstrate compliance with the emission limits in the permit.

Table 3: Permit No. 89020

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Product Recovery Baghouse	PM	1.69 lb/hr	Conduct quarterly 30-minute visible emissions inspections using EPA Method 22. Alternatively, install bag leak detection system. Annual performance test to demonstrate compliance with the emission limit. Semi-annual blacklight testing, if bag leak detection system is not installed.	Record periodic inspections including date and any corrective actions taken on applicable equipment.	
Mill Feed Breaker Discharge Baghouse	PM	.00579 lb/hr	Conduct quarterly 30-minute visible emissions inspections using EPA Method 22. Alternatively, install bag leak detection system. Initial performance test to demonstrate compliance	Record periodic inspections including date and any corrective actions taken on applicable equipment.	

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
			with the emission limit. Subsequent biannual testing will be required if performance test results are below 75% of the emission limit. If performance test results are above 75% of the emission limit, annual testing will be required until results are below 75% of the emission limit. Semi-annual blacklight testing, if bag leak detection system is not installed.		
Mill Feed to Rotary Valve Filter	PM		Install instrumentation capable of measuring pressure drop across the equipment. Conduct weekly inspections of pressure drop across the equipment.	Record periodic inspections including date and any corrective actions taken on applicable equipment.	
Product Storage Transfer Baghouse	PM		Conduct quarterly 30-minute visible emissions inspections using EPA Method 22. Alternatively,	Record periodic inspections including date and any	

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
			install bag leak detection system. Install instrumentation capable of measuring pressure drop across the equipment. Conduct weekly inspections of pressure drop across the equipment.	corrective actions taken on applicable equipment.	
Cartridge Filter Silo Loadout 1	PM		Install instrumentation capable of measuring pressure drop across the equipment. Conduct weekly inspections of pressure drop across the equipment.	Record periodic inspections including date and any corrective actions taken on applicable equipment.	
Cartridge Filter Silo Loadout 2	PM		Install instrumentation capable of measuring pressure drop across the equipment. Conduct weekly inspections of pressure drop across the equipment.	Record periodic inspections including date and any corrective actions taken on applicable equipment.	

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Storage Silo Bin Vent 1	PM		Install instrumentation capable of measuring pressure drop across the equipment. Conduct weekly inspections of pressure drop across the equipment.	Record periodic inspections including date and any corrective actions taken on applicable equipment.	
Storage Silo Bin Vent 2	PM		Install instrumentation capable of measuring pressure drop across the equipment. Conduct weekly inspections of pressure drop across the equipment.	Record periodic inspections including date and any corrective actions taken on applicable equipment.	
Off Spec Bin Vent	PM		Install instrumentation capable of measuring pressure drop across the equipment. Conduct weekly inspections of pressure drop across the equipment.	Record periodic inspections including date and any corrective actions taken on applicable equipment.	
Hot Gas Generator	PM	20% Opacity			
	NO_X	500 ppm			

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
	SO_2	600 ppm			
Fugitive Dust	PM	40% Opacity	A Method 9 observer is required to conduct a daily survey of visible emissions. The Permittee shall maintain records of the total gallons of water applied, frequency of water application, each day mining activities did not occur, each day having at least .01 inches of precipitation, each day that follows a significant precipitation event, and the results of daily visible emissions monitoring.	Record of the dates and types of dust control measures employed, and if applicable, the results of any Method 9 observations, and any corrective action taken to lower the opacity of any excess emissions.	
Abrasive Blasting	PM	20% Opacity		Record the date, duration and pollution control measures of any abrasive blasting project.	
Spray Painting	VOC	20% Opacity Control 96% of the overspray		Maintain records of the date, duration, quantity of paint used, any applicable MSDS, and pollution	

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
				control measures of any spray painting project.	
Demolition/ Renovation	Asbestos			Maintain records of all asbestos related demolition or renovation projects including the "NESHAP Notification for Renovation and Demolition Activities" form and all supporting documents	

VIII. ENVIRONMENTAL JUSTICE ANALYSIS

The EPA (Environmental Protection Agency) defines Environmental Justice (EJ) to include the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and polices. The goal of completing an EJ assessment in permitting is to provide an opportunity for overburdened populations or communities to allow for meaningful participation in the permitting process. Overburdened is used to describe the minority, low-income, tribal and indigenous populations or communities that potentially experience disproportionate environmental harms and risks due to exposures or cumulative impacts or greater vulnerability to environmental hazards.

The EPA developed EJSCREEN, a publicly available tool that uses nationally consistent data, to produce maps and reports detailing environmental and demographic indicators that can be used to evaluate EJ concerns. The EPA selected an 80th percentile threshold for this action to evaluate the potential for EJ concerns in a community, meaning that if the area of interest exceeds the 80th percentile for one or more of the EJ indexes, the EPA considers that area to have a high potential for EJ concerns. The ADEQ mapped the location of the Boral Kirkland Mine facility and reviewed a five-mile radius around the facility for potential Environmental Justice concerns (see Figure 1 below).

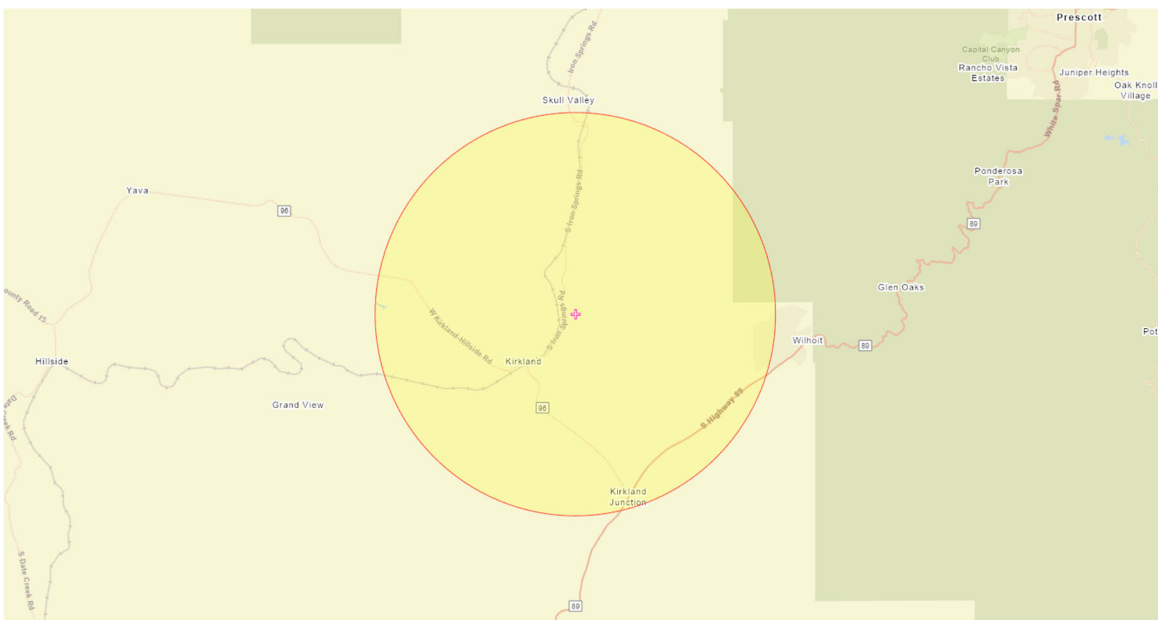

Figure 1: Five-mile radius of the Boral Kirkland Mine facility

A. Demographics

The ADEQ relied on data from the EPA EJ Screen tool to assess the demographics of the communities near the initial location for this proposed facility. The EJSCREEN report shows that the Demographic Indicators for Minority Population, Low Income Population, Linguistically Isolated Population, Population with Less Than High School Education, and Population Under 5 years of age, and Population over 64 years of age are all below the 80th percentile threshold. In this case, the EJ index for "Population over 64 years of age" exceeds the 80th percentile threshold, being in the 91st percentile for the State of AZ and

97th percentile for the USA. Boral Materials was required to performed air quality dispersion modeling to ensure that the emissions from the facility do not contribute to any exceedances of the National Ambient Air Quality Standards (NAAQS). ADEQ requires public notice in two newspapers that circulate within the surrounding community, in addition to publishing the notice electronically to ensure that the community has ample opportunity to provide comments on the draft documents prior to a final permitting decision. Additionally, ADEQ will be holding a public hearing in an effort to ensure the community has ample opportunity to provide comments prior to the final permitting decision.

B. Summary of Air Quality Impacts

All air quality related environmental indicators within a 5-miles radius of the facility were below the 80th percentile for both Arizona and the USA averages. Additionally, Boral Materials conducted air quality dispersion modeling to determine if emissions from the Boral Kirkland Mine facility will contribute to a NAAQS exceedance. A complete review of the air quality analysis can be found in Section IX below. Based on the modeling analysis results, ADEQ has determined that the issuance of the Air Quality Permit for Boral Materials will not interfere with attainment of the NAAQS, and will not have an adverse impact on the community.

C. Conclusion

The ADEQ concludes that the protections afforded by Arizona Revised Statutes (A.R.S.) §49-426, which is imposed through the permit, ensure that the public health and environment in Arizona are protected and that the public notice and comment opportunities afforded to the community on this new permit application satisfy the public participation component of the EPA EJ Guidance. The dispersion modeling conducted further concludes that the Boral Kirkland Mine facility demonstrates compliance with the NAAQS, and that the emissions from the facility will not result in any significant environmental or public health impacts.

IX. AMBIENT AIR IMPACT ANALYSIS

This section summarizes the ADEQ's findings regarding the ambient assessment submitted by Boral in support of its Class II air quality permit application for the construction and operation of the Boral Kirkland Mine facility. Considering the size and complexity of the Boral Kirkland Mine facility, ADEQ requires Boral to obtain a Class II permit under A.A.C R18-2-302.01.D. Because the facility's PTE (excluding fugitive emissions) is greater than the permitting exemption threshold for NO_X, PM_{10} and $PM_{2.5}$, the three criteria pollutants trigger the minor NSR review. Under the minor NSR program, the Permittee must address minor NSR requirements by conducting a NAAQS modeling exercise or a RACT analysis. Although Boral elected to conduct a RACT analysis for emission units, ADEQ requested Boral to perform regulatory dispersion modeling to demonstrate that the proposed project's emissions will not interfere with attainment and maintenance of NAAQS based on the ADEQ's discretion. The pollutants subject to this ambient assessment review are PM_{10}, $PM_{2.5}$, NO_X and Lead (Pb). No modeling was done for SO_2 and CO due to relatively lower emission rates.

The Boral Kirkland Mine facility is within 2 miles of a learning site, and consequently the facility is subject to the Learning Site Policy. ADEQ has established the Learning Site Policy to ensure that children at learning sites are protected from criteria air pollutants as well as HAPs. Because the NAAQS modeling analysis for learning sites is handled under the Minor NSR program, Boral performed additional dispersion modeling to estimate ambient concentrations for HAPs and compared them against Acute/Chronic Ambient Air Concentrations (AAAC and CAAC) for listed air toxics.

ADEQ reviewed the ambient air impact analysis following the EPA's Guideline on Air Quality Models (40 CFR Part 51 Appendix W)[1] and ADEQ's Modeling Guidelines for Arizona Air Permits (hereafter "ADEQ Guidelines").[2]

A. Model Selection

Boral used the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) model for the ambient impact analysis. AERMOD is the EPA-preferred regulatory model for estimating impacts at receptors located in simple terrain and complex terrain (within 50 km of a source) due to emissions from industrial sources. AERMOD consists of three major components: AERMAP, used to process terrain data and develop elevations for receptors; AERMET, used to process the meteorological data; and AERMOD, used to estimate the ambient pollutant concentrations.

Boral used AERMOD version 19191 for the modeling analysis. The EPA recently released a new version of the AERMOD modeling system - version 21112. Upon reviewing the model change bulletin and performing model test runs, ADEQ determined that the recent changes that have been made to AERMOD will not affect the results of Boral modeling exercise.

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B. Source Inputs

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[1] https://www.epa.gov/sites/production/files/2020-09/documents/appw_17.pdf
[2] https://static.azdeq.gov/aqd/modeling_guidance_2019.pdf

1. Sources of Emissions

The proposed project will mine and process up high quality natural pozzolan. The primary pollutants emitted are particulate matter (PM). Non-fugitive emissions are from dust collection systems while fugitive emissions can occur from truck loading/unloading, plant feed, unpaved roads, paved roads and storage piles. For a detailed description, please refer to Sections II and IV.

2. Modeled Emission Rates

Boral estimated the maximum emission rates for dust collectors based on control device nominal air flow and manufacturer grain loading guarantees. Boral estimated the maximum emission rates for fugitive emissions (truck loading/unloading, plant feed, unpaved roads, paved roads) using the maximum hourly process rate of 100 tons per hour.

3. Source Configurations and Source Types

Boral modeled the emissions from dust collectors as point sources. Stack parameters for the point sources were based on design parameters from manufactures.

Boral characterized the emissions from unpaved and paved roads as a series of volume sources. Boral also characterized the fugitive emissions from truck loading/unloading, plant feed, and storage piles as volume sources. The volume source parameters, including initial lateral dimension (σy_0), initial vertical dimension (σz_0) and release height, were estimated based on the horizontal and vertical dimensions of the volume source, following ADEQ Guidelines and the AERMOD User's Guide.

4. Off-site (nearby) Sources

The EPA recommends that all nearby sources, that are not adequately represented by background ambient monitoring data, should be explicitly modeled as part of the NAAQS analysis. To determine which nearby sources should be explicitly modeled in the air quality analysis, the EPA has established "a significant concentration gradient in the vicinity of the source under consideration" as the sole criterion for this determination. There are no off-site stationary sources near Boral Kirkland Mine facility that would cause a significant concentration gradient within the vicinity of the project site. Therefore, there are no near-by sources that should be explicitly modeled. The impact from distant off-site sources are represented by background ambient monitoring data as discussed in Part G below.

C. Meteorological Data

1. Meteorological Data Selection

For regulatory dispersion modeling analyses, 5 years of National Weather Service (NWS) station meteorological data, or at least 1 year of site-specific meteorological data, or at least 3 years of prognostic meteorological data should be used.

Boral utilized 5 years of the meteorological data collected at the Prescott Ernest A. Love Field Airport (Prescott Airport) for the dispersion modeling analysis. Boral provided justification on the representativeness of the meteorological data following the four criteria as listed in Appendix W Section 8.4.1.b: (i) spatial proximity of the meteorological monitoring site to the facility; (ii) complexity of the topography of the area; (iii) exposure of the meteorological sensors; and (iv) period of time during which the data are collected.

The Prescott Airport is the nearest surface meteorological station to the Boral project site. This station is well maintained and operated as it belongs to the Automated Surface Observing System (ASOS) network, a primary climatological observing network in the U.S. The siting of the meteorological tower and the quality of the meteorological collected meet the requirements for a regulatory modeling application. Additionally, due to the similarities in topography, climatology, and land cover between the area of the Prescott Airport and the project site area, it is reasonably concluded that the meteorological data collected from the Prescott Airport generally characterizes the transport and dispersion conditions in the project site area.

2. Meteorological Data Processing

ADEQ provided Boral the pre-processed meteorological files for the period of 2015 to 2019. ADEQ used the AERMET meteorological preprocessor (version 19191) to process the five-years of surface data collected from Prescott Airport along with concurrent upper air radiosonde data obtained from the Flagstaff NWS radiosonde station. ADEQ also used the EPA's AERSURFACE tool (version 20060) to calculate surface characteristic parameters (albedo, Bowen ration and surface roughness) required by AERMET.

During the permit review period, ADEQ processed the most recent five-years of meteorological data (2016-2020) using the most recent version of AERMET (version 2112). ADEQ reran the model with the updated meteorological dataset and found that the effects of the updated meteorological dataset on the modeled results were marginal.

D. Ambient Air Boundary and Receptor Network

The applicants are required to demonstrate modeled compliance with the NAAQS at receptors spaced along and outside the ambient air boundary (AAB). For modeling purposes, the atmosphere over land owned or controlled by the stationary source may be excluded from ambient air "where the source employs measures, which may include physical barriers, that are effective in precluding access to the land by the general public".[3]

[3] EPA. 2019. Revised Policy on Exclusions from "Ambient Air". https://www.epa.gov/sites/production/files/2019-12/documents/revised_policy_on_exclusions_from_ambient_air.pdf

Boral used the Kirkland Mine operations boundary as the ambient air boundary for modeling purposes. Boral is required to use fencing, natural topographic barriers, signage, security patrols, and/or other measures to effectively preclude the public access. See the Draft Permit Section VII - PUBLIC ACCESS RESTRICTIONS.

Following ADEQ Guidelines, Boral set up a receptor network to determine areas of maximum predicted concentrations. The grid spacing utilized for the receptors are as follows: ambient area boundary set at 25 m intervals; fine receptor grid of 100 m, extending from AAB to 1 km; medium receptor grid of 350 m, extending from 1 km to 5 km; coarse grid receptor grid of 750 m, extending from 5 km to 20 km. Boral used the AERMAP terrain processor (version AERMAP - Version 18081) to process the National Elevation Data (NED) 1/3 arc second data to generate the receptor elevations and hill heights.

E. Land Use Classification

The rural/urban classification of an area is determined by either the dominance of a specific land use or by population data in the study area. The land-use procedure specifies that the land-use within a three-kilometer radius of the source should be determined using the typing scheme developed by Auer.[4] Boral determined the project site area as "Rural" based on the land use method. Therefore, Boral utilized the default, rural dispersion coefficient for the modeling analysis.

F. Building Downwash Effects

Boral evaluated building downwash effects based on building and stack location and dimensions, and the EPA's Building Profile Input Program Plume Rise Model Enhancements (BPIP-PRME).

G. Background Concentration

Background concentrations should be representative of regional air quality in the vicinity of a facility. Typically, background concentrations should be determined based on the air quality data collected in the vicinity of the proposed project site. However, if there are no monitors located in the vicinity of the project, a "regional site" may be used to determine background concentrations. Per Appendix W Section 8.3.2 b, a regional site is "*one that is located away from the area of interest but is impacted by similar or adequately representative sources*."

Because there are no monitoring sites in the immediate vicinity of the Kirkland Mine facility, a "regional site" must be selected to determine background concentrations. In determining whether a regional site is representative or not, ADEQ suggests that the Permittee considers three factors: (i) monitor location; (ii) data quality; and (iii) data currentness. Taking the three factors into account, Boral selected the Alamo Lake monitor,

[4] Auer, A.H. 1978. Correlation of Land Use and Cover with Meteorological Anomalies, Journal of Applied Meteorology, 17:636-643.

a regional scale monitor operated by ADEQ, for determining background concentrations. The Alamo Lake monitor is the closest active monitor to the Kirkland Mine facility. In general, the emission sources in the area where the monitor is located are similar to those surrounding the Kirkland Mine facility. Additionally, the monitoring data collected from the Alamo Lake monitor meet the minimum 75 percent data capture requirement per quarter based on the criteria in 40 CFR Part 50, Appendices K, N, and S.

1. Background Concentration for 24-hour PM_{10}

Boral calculated the 24-hour PM_{10} background value based on average of the 2nd highest yearly values from years 2017 through 2019, which was 70 µg/m^3. Boral excluded the 2020 data because the two highest concentrations occurring on 8/17/2020 and 8/18/2020 were likely due to a pair of dust storms. Upon reviewing the weather data and field records, ADEQ found that strong regional thunderstorms occurred on the two days. Therefore, ADEQ determined that the monitoring data collected on the two days could be removed for determining background concentrations due to unusual events or atypical conditions. By excluding the two-day data, ADEQ obtained a background concentration of 67 µg/m^3 using 2018-2020 data.

ADEQ also reviewed the historical monitoring data (2011-2013) collected from the Prescott Valley PM_{10} monitor. While this monitor was disactivated in 2014, it is expected that these data may still represent the current air quality in Prescott Valley (or Skull Valley). For the Prescott Valley monitor, the average of the highest yearly values from 2011 through 2013 was 60 µg/m^3 while the average of the 2nd highest was 29 µg/m^3. Therefore, the background concentration of 70 µg/m^3 Boral used in their dispersion modeling analysis would likely provide a conservative estimate of the background concentration at Prescott Valley or Skull Valley.

2. Background Concentration for 24-hour and Annual $PM_{2.5}$

Boral calculated the annual $PM_{2.5}$ background value based on the average of the most recent three years (2018-2020) of the annual average $PM_{2.5}$ concentrations, which was 4.2 µg/m^3. Boral calculated the 24-hour background $PM_{2.5}$ value based on the average of the 98th percentile 24-hour values measured over the last three years, which was 9.7 µg/m^3.

ADEQ also reviewed the historical monitoring data (2011-2013) collected from the Prescott Valley $PM_{2.5}$ monitor. The average of the annual average $PM_{2.5}$ concentrations for 2011-2013 was 4.1 µg/m^3. The average of the 98th percentile 24-hour values measured over these three years was 9.7 µg/m^3. The $PM_{2.5}$ background concentrations Boral used were nearly identical to the historical monitoring data collected from Prescott Valley.

3. Background Concentration for NO_2

There are very limited NO_2 monitoring sites in Arizona and all monitoring sites are currently located in the Phoenix/Tucson metropolitan area. These urban monitors are significantly influenced by emissions from heavy vehicular traffic and industrial sources that do not exist near the Boral project site area.

ADEQ has collected two-year hourly NO_2 ambient air monitoring data at the Alamo Lake site from July 2014 to June 2016. As the Boral project site is similar to the Alamo Lake site in that the only sources of NO_2 are minor vehicle traffic, Boral selected the Alamo Lake site as a representative site for the background determination. To calculate the background concentration, the EPA recommends using the 98th percentile (the 8^{th} highest) of the annual distribution of daily maximum 1-hour values averaged across the most recent three years of monitoring.[5] Boral used the highest 1-hour concentration of the two-year monitoring data (14 ppb) as the 1-hour background NO_2 concentration. This method was conservative and acceptable. The maximum annual average concentration of NO_2 at the Alamo Lake site was 1.4 ppb. Boral conservatively used 3 ppb for the impact analysis for annual NO_2.

H. One - Hour NO_2 Modeling Methodology

Per Appendix W Section 4.2.3.4-d, the EPA recommends three-tiered approach for 1-hour NO_2 modeling. Boral used Tier 2 Ambient Ratio Method (ARM2) with default ambient NO2/NOx ratios (a minimum ratio of 0.5 and a maximum of 0.9).

I. NAAQS Modeling Results

Table 4 summarizes the modeled results for PM_{10}, $PM_{2.5}$, and NO_2, and Lead. Representative background concentrations were added to modeled impacts and the total concentrations were then compared to the NAAQS. As shown in Table 4, emissions from the Boral proposed project will not cause or contribute to a violation of the NAAQS under the operational limits/conditions as proposed in the draft permit. The AERMOD modeling analysis also revealed that the modeled design concentrations for all pollutants occurred within or near the ambient air boundary (property line).

Table 4: Modeled Results for Criteria Air Pollutants

Pollutant	Averaging Period	Modeled Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Maximum Ambient Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
PM_{10}	24-hour	48.9	70.0	118.9	150
$PM_{2.5}$	24-hour	12.6	9.7	22.3	35

[5] https://www.epa.gov/sites/production/files/2015-07/documents/appwno2_2.pdf

Pollutant	Averaging Period	Modeled Concentration (μg/m^3)	Background Concentration (μg/m^3)	Maximum Ambient Concentration (μg/m^3)	NAAQS (μg/m^3)
	Annual	6.4	4.2	10.6	12
NO_2	1-hour	26.3	29.1	55.4	188.6
	Annual	5.6	1.6	7.2	100
Lead	Rolling 3-month	0.06	0	0.06	0.15

J. HAPs Modeling for a Learning Site

As indicated in the lab analysis, low levels of heavy-metal HAPs may be present in the particulate emissions which naturally occur in natural pozzolan material being mined. These HAPs include arsenic, chromium, nickel, and lead. Boral estimated the emission rates of HAPs based on the highest value detected from the laboratory analysis conducted on natural pozzolan from the mine. Because the impacts of lead was handled in the NAAQS modeling analysis, the HAPs modeling analysis focused on the other three heavy metals (arsenic, chromium and nickel). Boral estimated the maximum 1-hour concentrations for each source group and then added maximum impacts from each source group to determine an overall impact value. This methodology is expected to be conservative since the maximum impacts from each modeled source do not necessarily occur on the same day or within the same hour. Table 5 summarizes the modeled results for HAPs. As shown in Table 5, the modeled 1-hour concentrations for HAPs are well below the Acute AAC and the modeled annual concentrations are below Chronic AAC.

Table 5: HAPS Modeling Results

HAPs	Averaging Period	Modeled Concentration (mg/m^3)	Acute AAC (mg/m^3)	Chronic AAC (mg/m^3)
Arsenic	1-hour	3.44E-06	2.5	
	Annual	5.58E-09		4.41E-07
Chromium	1-hour	3.09E-05	0.1	
	Annual	5.02E-08		1.58E-07
Nickel	1-hour	1.44E-05	5	
	Annual	2.33E-08		7.90E-06

X. LIST OF ABBREVIATIONS

AAB .... Ambient Air Boundary
AAAC........ Acute Ambient Air Concentrations
A.A.C. .... Arizona Administrative Code
ADEQ .... Arizona Department of Environmental Quality
AERMAP........ Terrain data preprocessor for AERMOD
AERMOD .... AMS/EPA Regulatory Model
AERSURFACE .... Surface characteristics preprocessor for AERMOD
AERMET .... AERMOD Meteorological Preprocessor
AMS........ American Meteorological Society
AQD........ Air Quality Division
AQRV .... Air Quality Related Values
ARM .... Ambient Ratio Method
A.R.S........ Arizona Revised Statutes
ASOS........ Automated Surface Observing System
BACT........ Best Available Control Technology
BPIP .... Building Profile Input Program
Btu/ft^3........ British Thermal Units per Cubic Foot
CAAC........ Chronic Ambient Air Concentrations
CEMS........ Continuous Emissions Monitoring System
CFR........ Code of Federal Regulations
CO........ Carbon Monoxide
CO_2........ Carbon Dioxide
CO_2e........ CO_2 equivalent basis
Dscf........ Dry standard cubic foot
EPA .... Environmental Protection Agency
FERC .... Federal Energy Regulatory Commission
FLM .... Federal Land Manager
°F........ degrees Fahrenheit
ft........ Feet
g .... Gram
HAP .... Hazardous Air Pollutant
hp .... Horsepower
hr........ Hour
IC .... Internal Combustion
kPa .... Kilopascal
m .... Meter
NAAQS........ National Ambient Air Quality Standard
NED .... National Elevation Dataset
NO_X .... Nitrogen Oxides
NO_2 .... Nitrogen Dioxide
N_2O .... Nitrous Oxide
NSPS........ New Source Performance Standards
NWS .... National Weather Service
O_3 .... Ozone
Pb .... Lead
PM........ Particulate Matter
PM10........ Particulate Matter less than 10 µm nominal aerodynamic diameter
PM2.5........ Particulate Matter less than 2.5 µm nominal aerodynamic diameter

PRIME .... Plume Rise Model Enhancements
PSD .... Prevention of Significant Deterioration
psia .... Pounds per square Inch (absolute)
PTE .... Potential to Emit
RACT .... Reasonable Available Control Technology
sec .... Seconds
SIL .... Significant Impact Level
SO_2 .... Sulfur Dioxide
TPY .... Tons per Year
VOC .... Volatile Organic Compound
yr .... Year